

san diego technics

A.K.A. ISSUE 23 OF PYROTECHNICS - THE NOW & THEN NEWSLETTER OF



PERPETRATED LARGELY BY Jamie Hanrahan

AIDED & ABETTED BY George Papa

FEBRUARY, 1980

Greetings and Felicitations!

Yes, Virginia, there *are* techies in San Diego, California... a whole two of us so far. As proof of our existence, we offer the collection of schematics, sage advice, half-witticisms, and artwork which you now hold in your hands.

PRODUCTION NOTES

The copy for this issue is the product of a DEC WS78 Word Processor. The WS78 consists of a VT52 terminal with a PDP-8 computer inside, an RX01 dual floppy disk drive, a Diablo Hytype II printer, and DEC word processing software. The system also has a communications port and can be used as an intelligent terminal: "Documents" (files) can be sent to or received from remote computers or terminals. No, it isn't mine (sigh); it belongs to the company I work for. It's a small firm and there's generally no problem with using the equipment for personal projects, as long as it's not on company time.

SAN DIEGO FANDOM

From what I've heard, news of the existence of fans of any sort in San Diego -- let alone GT members -- may come as a bit of a surprise. We actually have a fairly large and active group here, but it's only been recently that we've stirred out of California in a big way. Our first major foray was to Iguacon in 1978; about two dozen of us were there. About eight of us are planning to get back to Noreascon this year (George and I included, so we'll be able to dispel any doubts you might have about our reality--and you may well have some, after reading this issue.)

About a hundred people regularly attend meetings of the local fan club, S.T.A.R./San Diego, of which George is President and I am Ombudsman. Recently George has organized another sort of get-together called "The Twilight Zone", or, more commonly, simply "The Zone". Zone meetings are held every other Saturday at George's house, and are occasion for all of the builders among us (be we builders of costumes, props, circuits to go in props, or fanzines) to get together, work on our current projects, and share ideas, experience, tools, and fannish conversation. (Why the Twilight Zone? Because that's where all universes come together.) The Zone has proven to be a great idea; the atmosphere does incredible things for one's productivity... and besides, we're having a lot of fun.

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---Jamie

The Soapbox

I have been greatly disturbed of late by fandom's casual acceptance of occultism. For some time I thought it was a purely local phenomenon, and therefore unimportant -- after all, we Californians have always been known for aberrant behavior. But what I saw at Iguacon changed my mind: Belief in the occult in general, and in astrology and tarot cards in particular, is at least as widespread in fandom as it is among the general populace.

And the fans who know better are so damned passive! If I were to start a discussion among my co-workers of the relative merits of Geminis or Libras as girlfriends, I could depend on at least one of them to say, "You don't really believe in that nonsense, do you?" But in fandom we seem to have adopted a live-and-let-live attitude; anybody at a con who commences giving "readings" of any sort can count on an avid audience of Believers, and an accepting silence from the rest.

Well, I wish to state that, from now on, there will be at least one fan who cannot be counted upon to remain acceptingly silent. I have always been extremely tolerant of other people's beliefs, faiths, and attitudes, but this is where I draw the line. Any time a fannish discussion that I'm part of turns toward the occult, you can count on me to not be silently accepting, but rather to be a staunch supporter of the rational, reasoning, scientific point of view, and to demand that the Believers present one good thesis to support their position.

Now, I am well aware that this will make me quite unpopular in some circles. While fans generally hold nothing sacred, occultism seems to be a current exception, and my outspokenness will no doubt be regarded by some as terribly gauche. I am furthermore aware that my statements will have little or no effect on those who already believe in the occult. So one might well ask why I should bother.

Well, basically, I should bother because I feel that occultism's popularity is a bad thing. To me it represents a distrust and rejection of science -- and a rejection of science is the absolute last thing we need right now. It's true that those who already believe won't be listening. But in any group that contains both Believers and rationalists, there will also be some -- probably a majority -- who haven't yet made up their minds. I doubt that occultism can pick up many more followers if it is openly questioned. I think that the only reason for its being as popular in fandom as it is is that it hasn't been questioned.

So I intend to do a lot of questioning. Loudly and often.

I'm just hoping that I won't be alone.

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GENERAL TECHNICS is an organization of fannish techies (and not techish fannies, as some wiseass reported) who share data, resources, and experience in pursuit of a good time and occasional profit. The group meets mainly at cons, hamfests, and private berserker weekends.

MEMBERSHIP is no big thing, but you must be prepared to contribute to the group. At the very least this means answering questions on any topics of your choice, by mail, from members who enclose an SASE. Write a letter to

Jeff Duntemann
301 Susquehanna Road
Rochester, NY 14618

explaining how you'd like to contribute and why you think you're a techie. Also send a quantity of first-class postage stamps (whatever value it happens to be this week). If the aforementioned person can read your handwriting, you are an

APPRENTICE TECHIE and entitled to call yourself a member of General Technics. Interesting things will show up in your mailbox at random intervals:

PYROTECHNICS and special publications relating to things techie. You will be in GT until your stamps run out; renewal of membership is synonymous with sending more stamps. If you decide to quit, we'll use one of your stamps to send the rest back to you.

WE NEED cartoons, articles, construction projects, techie hints, hot inside rumors about neat state-of-the-art techie toys, book reviews, TV and movie reviews, and anything else kookie and entertaining with a techie slant. Check out the last several issues and you'll get the idea.

REMEMBER -- TECHIES DO IT WITH FLASH!

GT Biodata

I originally wanted to run bios from all the California members. Unfortunately, I mailed my requests-for-contributions to the LA people at the peak of the Christmas season, and only Victor Koman had the time to respond. Oh, well, it was a nice idea. Here are biodatas from us San Diegans; Victor, I've typeset your bio and sent it to Jeff, so he can run it in an upcoming issue. Or maybe the LA people can get together and do a Pyro of their own later this year... I mean, if we can do it with only two people...

JAMIE E. HANRAHAN

(Before all the (other) lonely males in this group start to pant, I'd better point out that the name "Jamie" is used both ways, and that my middle name is Edward.) I was born on May 24, 1952, in Lakewood, Ohio; the family (all three of us -- I'm an only child) moved to California and settled firmly in San Diego by the time I was four. I started to read both sf and beginning-electronics books in grade school, discovered Popular Electronics and Electronics Illustrated while in junior high, and eventually started fiddling with some of the stuff I'd been reading about. During my junior year in high school I joined an Explorer Post that specialized in computers, and I happily spent the rest of my pre-college days learning Fortran, Basic, IBM S/360 JCL, and (ugh) COBOL, and sometimes even getting a program to run.

I acquired an A.S. in data processing from the local junior college, then went north to the L.A. area in search of my bachelor's, but I soon ran out of cash and had to go to work full-time. I have since managed to pick up all of the core requirements for a B.S. in Computer Science, but was still missing a few general ed. courses at last reckoning. Somewhere along the line I learned a hell of a lot about digital electronics, but I'm still a beginner in the analog department. I also managed to get hooked up with fandom, and

so have acquired the usual fannish skills relating to fanzine-publishing, convention-running, club-organizing, and the like. I'm thinking about going back to school, but not necessarily to finish the Computer Science degree; with a few years' experience I find that I don't really need it any more, and it might be more fun to fill in the gaps in my electronics training...or to start learning my way around a machine shop...

I'm currently employed by a software consulting firm in San Diego, doing programming on all kinds of bizarre assignments. Current projects include studying for my ham license, a number of blinky-light gadgets for local fen, a bullet-speed timer for a gunsmith friend, and the equipment for a pair of Gray Lensman outfits that George and I plan to awe everyone with at Noreascon. Hope to see most of you there; until then, clear ether!

GEORGE N. POPA III

I was born that cold and rainy February 13th in 1957; a Postal worker's son with a passion for tinkering. As soon as I learned to crawl and manipulate my fingers I began taking things apart to find out how and why they worked. As early as 1977 I began discovering how to put all these things back together again.

My formal education consists of two unfinished Bachelor's degrees, one in Electrical Engineering, and the other in Theater. I'm currently on hiatus from school, pursuing my avocation -- the building of props and miniatures -- with every hope of parlaying this knowledge into a career in the motion picture industry.

Having never been blessed with a girlfriend who was too keen on constructing costumes for me, I learned how to do it for myself, acquired a sewing machine, and currently "enjoy" the same kind of pestering most of the seamstresses in local fandom receive. My greatest accomplishment in this area to date is the construction of five Star Trek (the TV show) uniforms in the week before the premiere of Star Trek: The Motion Picture.

In closing I shall add that I'm the second half of the Lensman team, but that other alter-egos I shall assume at Worldcon in Boston include Han Solo, Aragorn, Captain Apollo, and Captain John Carter, Warlord of Mars. Kaor!

Duntemann's Corner

12/21/79--California! A nice place to visit, but I couldn't afford to live there. I'm glad Jamie & Company are getting along. I like appearing in guest-issues of Pyro. Makes me feel like an Elder Statesman or something. No spleen this issue; editorializing is the prerogative of the Editor, and the Editor is taking a vacation. I don't know at this point what Jamie is going to say on Page One, but whatever it is, Give 'em hell, Jamie.

I'm still trying to sell my Compucolor II system, so spread the word. It's a Model 5 (32K) with the 117 key keyboard plus outboard disk drive and lotsa software. Best offer over 2K gets it. I need to unload it because...I am at last going \$100. The system is already on order: The Ithaca Intersystems front-panel mainframe with 4 meg 280 CPU card, dual 8" floppies, and the MicroDivisions Screensplitter Word Processing Package, which includes the Screensplitter board and software, a 20 meg bandwidth long-persistence phosphor monitor, an IBM-Selectric lookalike keyboard, and the Wordsmith word processor program. Hardcopy is up in the air right now, but I'm investigating a source of cheap Diablo 1340 printers which may or may not exist. More on that next issue. I'm going to get some heavy writing done this year, people.

Now is the time to start campaigning for the Pyrotechnics Hugo Awards Slate. The idea is to get some of the talented people of GT onto the Hugo Ballot. You know damned well Dick Geis is going to win again, but it certainly would be something to be among the contenders, so...here's the slate:



DARK STARLOST IN SPACE: 1999 BOTTLES OF BEER ON THE WALL! by Chris Cloutier



For Best Fan Writer--George Ewing, who brings you "Zaps from the Backwoods" every issue since who knows how long ago.

For Best Fan Artist--Chris Cloutier, creator of "Dark Starlost in Space: 1999 Bottles of Beer on the Wall", "Astro-Snake," and lord only knows how many other delights in these pages.

For Best Pro Artist--Phil Foglio, who has won it for Fan Artist twice now and doesn't want to be considered for Fan Writer again. So Be it.

And, of course, For Best Fanzine--PyroTechnics, edited by that guy with the sideburns and the glasses.

Tell your friends! Bribe your relatives! Join Noreascon III! Vote the Straight GT Ticket this year!!

It's a crazy world. Several of my friends who claim to be pagans and atheists are holding Solstice parties, and Phil Foglio sent out a hilarious Happy Solstice card for the Christmas season. This is a good time of year to be celebrating, but why the solstice? Well, there was a solstice long before there was life on the Earth, and there will be solstices long after we have scattered among the far stars. It is an event in interplanetary geometry, nothing more. It doesn't really mean anything.

No self-respecting pagan or Atheist would celebrate the birth of Christ, because Christ was a myth. I'll admit that. Christ was at least a myth. (Further discussion of Christ becomes a matter of faith. Let's stop here for now.) The myth of Christ is the myth of the fusion of a powerful God with a fallible Man. Now I'll celebrate that.

Why? Because the myth implies that this \$1.98 worth of carbohydrates I live in is worth something, that within it is the vitality of our animal origins fused with the rational consciousness of our godlike aspirations. The myth means that there is nothing dirty about making love, and nothing pointless about reaching for the stars. The myth means that being human is worth the thousand trillion little deaths that brought it about. The myth means that in all humans there is born goodness, and potential greatness, if only we care to find it and bring it forth.

From that myth Carol and I take a wish that we offer all of you for this and every Christmas season: Take whatever you were born with and make the most of it. Build your rayguns with precision; draw your artwork with wit and sensitivity. Tell your tales with farflung imagination, love your partner with gentleness and unselfishness, and sing your songs from the very bottom of your heart. Strive to be more fully human, and celebrate being as fully human as you are.

---Jeff Duntemann

STAR TREK: The ~~Bleeder~~ Reel Motion Picture

(to go where Nomad has gone before)

review by George Popa and Jamie Hanrahan

There are a lot of Star Trek fans in San Diego. In fact, the local sf club got started as a chapter of the Star Trek Association for Revival (we still call ourselves S.T.A.R./San Diego as a tribute to our origins). The theater where Star Trek: The Motion Picture premiered allowed us 75 seats on opening night if we would show up in Trek costume; we filled them easily. This review includes opinions from most of those present at the opening. We hate to have to say it, but all in all, we were pretty disappointed.

The movie opened impressively enough. The model work, interiors, and photography on the Klingon ships were absolutely superb. The disintegration effect of the V'ger probes was damned impressive, and as far as we know, original. The Klingons' costumes were well done and apropos: They looked like something you would expect them to wear (much more so than the originals). True, the Klingon photon torpedoes seemed to come from the ships' main sensor dishes instead of their engine pods (as seen in the series), but by and large this sequence was very well done.

Almost immediately thereafter, though, we started to have our doubts. We were treated to an incredibly flat-looking matte painting (in the Starfleet HQ foyer scene), with obvious matte lines around the BART car. Then we had to twiddle our thumbs for what seemed like an hour while Kirk made love to his ship (that's the way it's described in the script, folks). As the movie progressed, we came up with far too many gripes to cover here; the following are a few of the more serious ones:

Too much time was spent on visuals that were supposed to be awesomely impressive, but weren't. ("Look! A special effect!")

The model of the Enterprise looked like it was a model.

The interiors of the Enterprise seemed to be designed to look impressive rather than realistic. In particular: The CRT displays that were showing meaningless jumbles of light; the yellow Lite-Brite set at Spock's station; the immense (and highly dangerous to be around) "energy tubes" in Engineering (if the flux in a waveguide is so dense that it appears to be a palpable substance, it had better be enclosed in something that's opaque at all wavelengths!)).

How the Hell did the Klingons change so much in only ten years? Where did the sagittal ridge come from? (Maybe they're descended from a spy who visited the Enterprise's new engine room...)

In the original series it was established that Vulcan has no moon. Now it seems to have acquired two.

The "automatic seat belts" looked awfully impractical, and proved so (Chekov still fell out of his chair).

The throttle control on Sulu's panel looked like it came from the Vulture on Salvage-1. We kept waiting for a shot of the clutch pedal under the dash.

By now you must have the impression that not a minute of film went by without our finding flaws. And you're probably right. But there were some things we liked:

Most of the characterizations were good, and McCoy in particular was superb (albeit overdone at times).

The shift into hyperspace was ok, and would have looked better if it hadn't sounded like Buck Rogers' stargate and looked like the time-travel effects in Time After Time.

The "wormhole" effect was the show-stopper; it was very well-conceived and -portrayed.

The fiber-optics patch panel in Engineering was a nice touch.

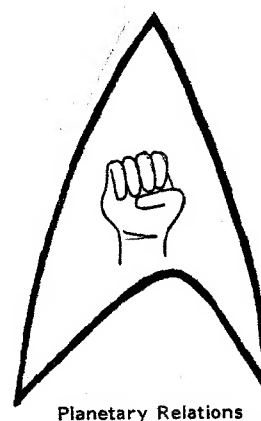
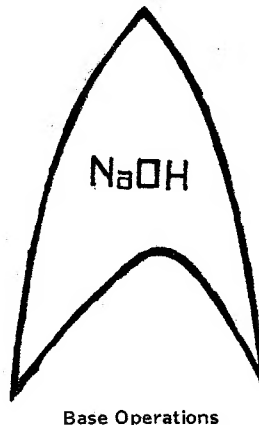
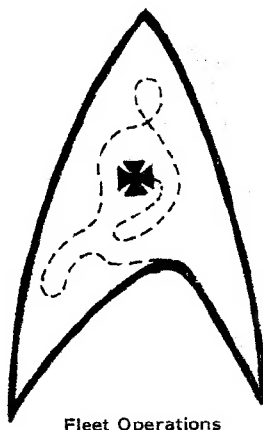
The graphics displays that were supposed to be looked at (as opposed to those in the background) were fantastic. This was particularly true of the tactical situation displays.

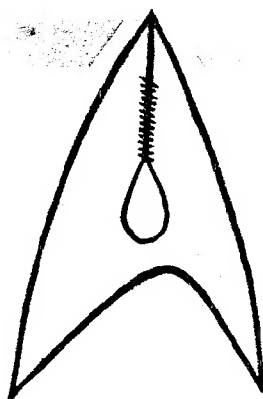
On the balance, it sounds pretty grim, doesn't it? But we could have forgiven all the goofs if the story had been any good or even original. It was neither. It would have made a good second-season episode; in fact, it did. Take "The Changeling", change the locale from wherever to the Solar system, make the menacing space-wedgie as big as it is powerful, mix in bits of a few other episodes, make the story of the probe's augmentation really implausible (was the "machine culture" the Cylon Alliance? Hmmmm.....), and you essentially have ST:TMP. It was a reasonably good story the first time around, but on the second pass it seemed awfully trivial. And this is not just the Trek fans talking: We heard groans from every corner of the audience when Kirk discovered V'ger's identity.

Oh, well. It could have been worse.

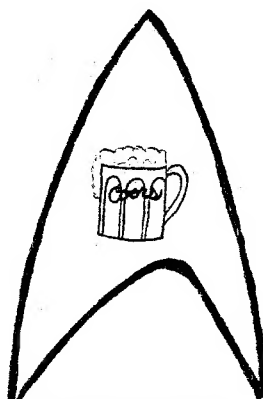
AFTERTHOUGHTS

One of the little things we noticed in the movie was that the division insignia patches on the uniforms were no longer distinctive; everyone was wearing the star design that used to be reserved for Command personnel. We felt that this was a mistake; in fact, we thought we should have seen more patch designs, not fewer. To wit:

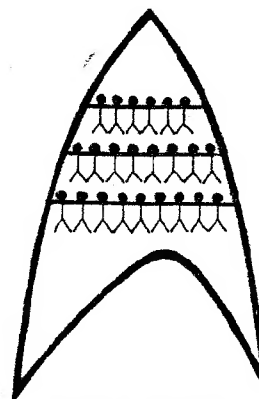




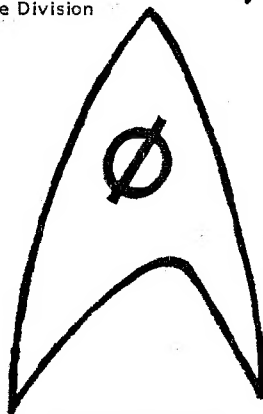
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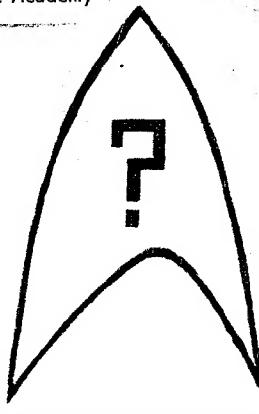
Star Fleet Academy



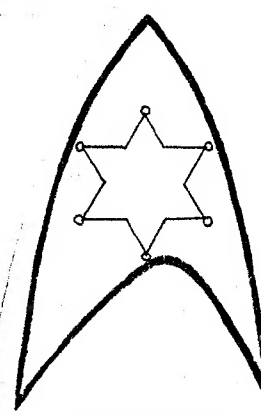
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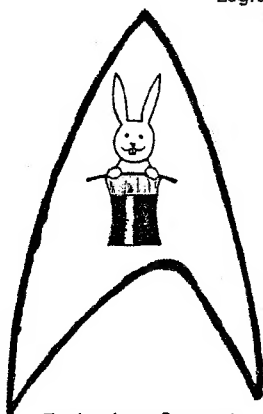
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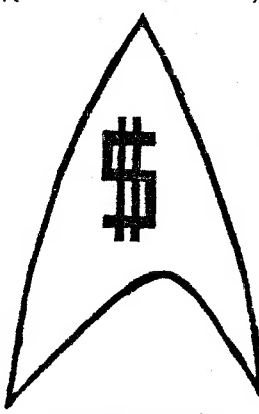
Military Staff Committee



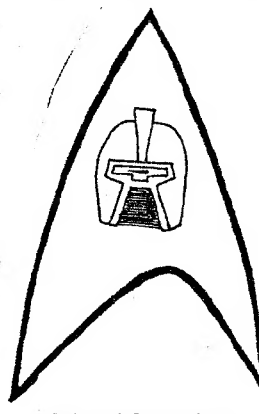
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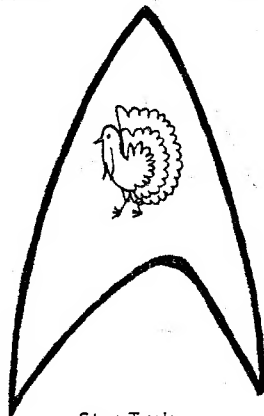
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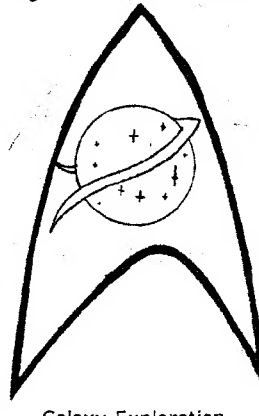
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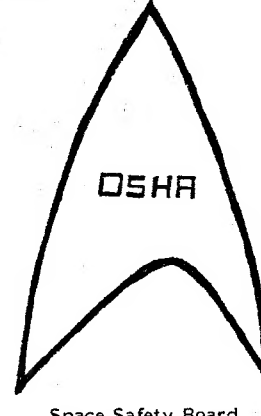
Colonial Operations



Star Trek -
The Motion Picture



Galaxy Exploration



Space Safety Board

(Some things never change)

Credits: Insignia designs by both of us;
artwork by George; division names from the
Star Fleet Technical Manual by Franz Joseph.

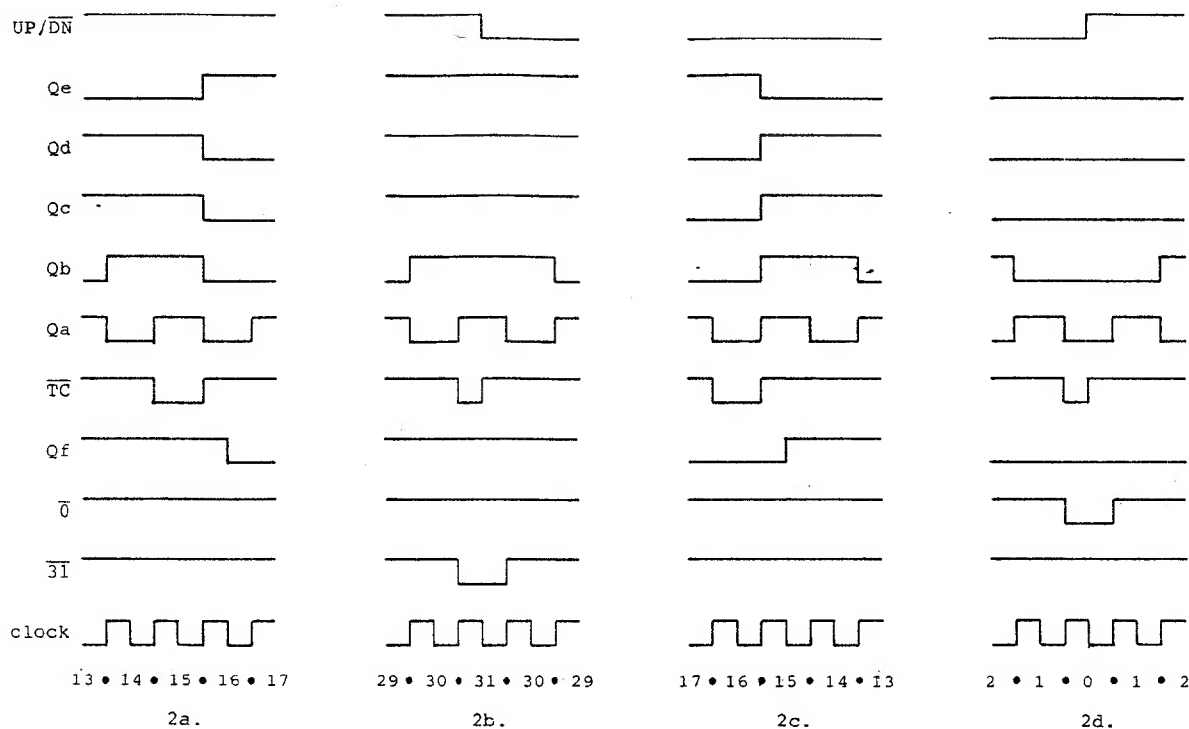


Figure 2

Flip-flop G provides the up/down switching. The 4029's count direction is controlled by its UP/~DN input -- if this input is high, the 4029 counts up; otherwise it counts down. Notice that whenever our counter reaches the end of its run, the desired new value of the UP/~DN line is equal to the inverse of Qe. So, we feed ~Qe to flip-flop G, run Qg to the UP/~DN input on the 4029, and clock flip-flop G in the middle of counts 0 and 31 -- gates I and J and inverter K take care of the clock gating. The ~0 and ~31 lines come from the output decoders; ~0 is low only when Qa through Qe are all low, and ~31 is low only when Qa through Qe are all high. Timing is shown in Figures 2b and 2d. (Despite what Don Lancaster says in the CMOS Cookbook, it is perfectly all right to change the 4029's UP/~DN line while its clock is low, as long as you do it 150 nanoseconds or more before the clock goes high again.)

If for some reason you want to use fewer than 32 LED's in your display, you can feed gate I from any two of the decoders' outputs.

The four outputs from the 4029 (Qa through Qd) and the two outputs of flip-flop E are fed to a pair of 4515 one-of-16 decoders. Qe and ~Qe enable one 4515 at a time, giving us a one-of-32, active-low decoder. The 32 outputs are connected to 4050 non-inverting buffers, which in turn drive the LED's.

Note that all four gates are really pieces of a single 4011 quad NAND package. Note, too, that you'll have one D flip-flop left over; all of its inputs should be tied to ground.

If the circuit is run from a nine-volt battery, the 4050's will be able to supply about 50 ma. to the LED's. If you want more current, use 4514 decoders (identical to 4515's, except that they have active-high outputs) and use 75492 drivers in place of the 4050's. You will also have to add a pair of inverters to provide the ~0 and ~31 lines (see Figure 3). The 75492's will sink up to 300 ma., enough to drive fair-sized incandescent bulbs.

If anyone comes up with a worthwhile use for this circuit, let me know, ok? [How about an LED "pendulum" for a digital clock? --GNP]

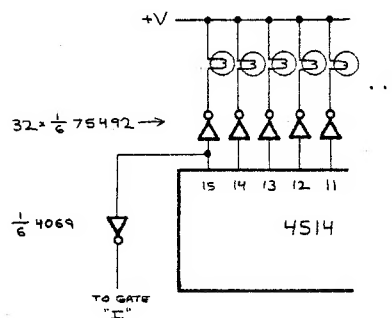
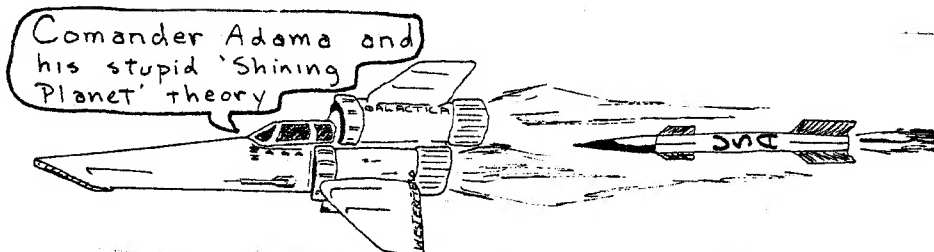


Figure 3

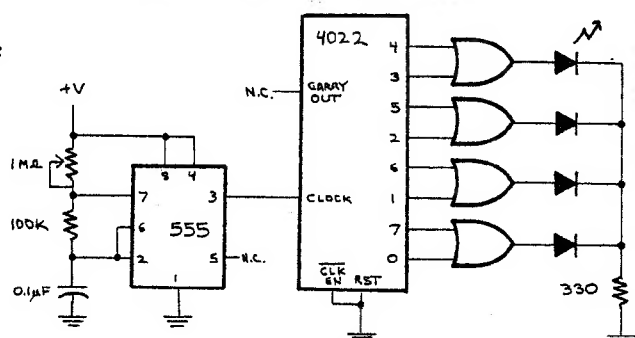


CMOS Mini-Cylon

BY GEORGE POPA

Some weeks after Jamie had breadboarded his design for a Cylon "red-eye" (and coincident with the acquisition of several MV50-like LED's), a bizarre project idea came to mind [I couldn't have said it better myself--JEH]. Although I have some experience with digital circuitry, my real forte is prop and miniature construction; and so quite naturally I began toying (ugh!) with the idea of putting a "red-eye" into the 4" Mattel Cylon doll. Strange, you say? Silly perhaps? Funny, that's what Jamie said...

I chose the 4" Cylon for several reasons. First, the smaller the model, the greater the challenge. Second, the large Cylon retails for \$13.00, the miniCylon for \$2.00. Finally, the large Cylon is nowhere near as accurately detailed as its smaller incarnation. Armed with this basic trivia, we can safely proceed to the circuitry.



Simplicity itself, a 555 clocks a 4022 divide-by-8 counter. The 4022 provides a one-of-8, active-high output. Appropriate outputs are OR'd together by the four elements in a 4071 quad 2-input OR package; these in turn drive the MV50's. With the LED's set side-by-side and a clock rate of approximately 8 Hz, the display yields an excellent illusion of a continuous, moving "red-eye".

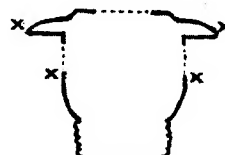
Now, the hard part: Installing the display in the model. The chestplate of the Cylon is snap-fitted over the other body parts, trapping the helmet so that it is free to rotate. Slip an

X-Acto knife between the seams of the chestplate and carefully work the two halves apart. Some or all of the press-fit joints will have to be broken in the process; cut off the remaining ones. Sand or scrape the chrome plating from the edges of the two halves so that they may be cemented together later.

Using a Dremel tool, carve out the inside of the helmet to make room for the display and wires. Then use a small drill bit (#65 or so) and/or a small Dremel end-mill (I used both) to drill some holes in the eye slot. Open and connect the holes with needle files. The eye slot is approximately 0.4" wide, thus the choice of 4 LED's. Mount the LED's with a few drops of "alpha" adhesive (Eastman 910, Permabond, etc.).

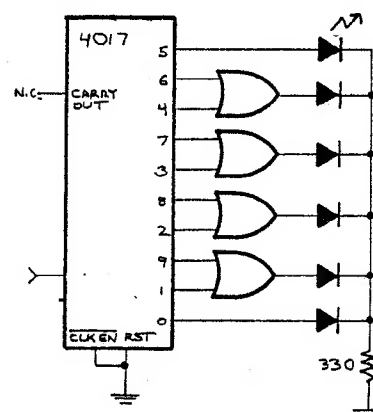
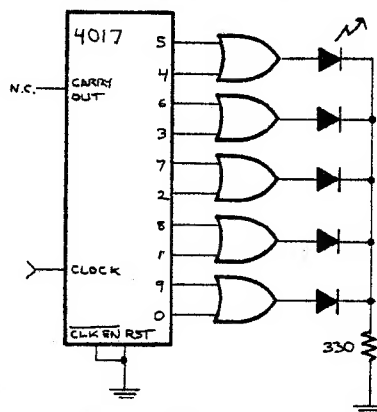
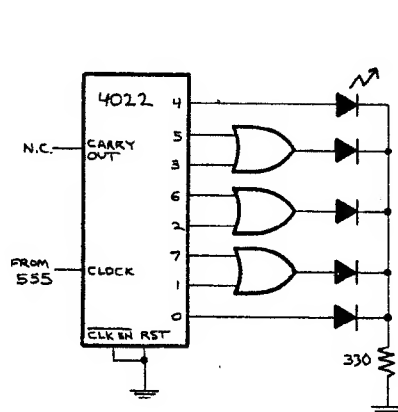
It was at this point in the project that I realized I wouldn't be able to fit the circuitry into the Cylon. Actually, I suppose if I could bring myself to bricklay the IC's and (shudder) solder directly to their leads, and then use four micro watch batteries (and get 15 minutes of action per set), the project could be totally self-contained. I am, however, quite fond of breadboard, sockets, and solder-wrap, so I drilled a hole through one of the Cylon's legs and mounted the doll on a box large enough for the circuitry and for a standard nine-volt battery, with the five conductors necessary for the display running through the hole.

To reassemble the Cylon, put the helmet in position, butt the two halves of the chestplate together, and use a syringe to deposit one drop of styrene cement (don't use alpha glues for this; they don't flow well enough) at each of the points noted on the diagram:



Now you're ready to impress the hell out of your non-tech friends in and out of fandom. Femfen in particular seem to be most impressed ("He's so cute!").

Of course, if you don't want a four-inch-high Cylon with a moving red-eye, there are other uses for the circuit. Here are some variations that use five and six LED's:



Getting the Lead Out

Small, rechargeable lead-acid cells and batteries are becoming available in reasonable quantities and at reasonable prices. (Even Poly Paks is selling them.) These units use the same basic chemistry as a car battery, but with some modifications to make portable use practical. They're far superior to NiCads for many purposes, but like most battery systems they have their own unique set of quirks. Here are some basic care and feeding instructions.

The portable, non-spillable lead-acid cell comes in two basic flavors. The first to be introduced was the vented, gelled-electrolyte cell, commonly called the gel-cell. The vents are one-way pressure-relief valves that allow excess charging gases to escape, so while these are often referred to as "sealed" cells, they're really only "sealed most of the time", and should not be charged in unvented enclosures. They may, however, be used and recharged in any attitude. Off-gassing normally happens only if the cell is charged too much or too fast; but if it does occur, there's no way to replace what's lost, so the cell's capacity will be permanently reduced.

Gel-cells are, to my knowledge, always found in batteries of two or more cells in a rectangular, non-openable plastic case. These are made by manufacturers such as Gould, Globe-Union, and Eldon Industries in a vast array of sizes, shapes, voltages, and amp-hour ratings. The Globe GC426-1 battery advertised by Poly Paks is typical.

The second type is the fully-sealed cell pioneered by Gates and now sold by both Gates and General Electric. These are made as individual cells enclosed in hermetically sealed steel cans. No electrolyte can be lost; all charging gases recombine (eventually) with the gel and plates. The cells are made in three cylindrical sizes, all with solder-tab terminals:

type	size (H x D)	capacity	peak current
"3/4 D"	2.15" x 1.34"	1.8 amp-hr	35 amps
"D"	2.58" x 1.34"	2.5 AH	50 A
"X"	3.10" x 1.74"	5.0 AH	100 A

They can be obtained individually or in multi-cell batteries; but unlike the vented batteries, the latter are actually made of discrete cells in an outer plastic or cardboard casing. The "X" cells and GE battery packs in Poly Paks' "solar energy" catalog are of this genre, even though PP calls them gel-cells.

CHARACTERISTICS: The table at the end of this article compares the two types to each other and to NiCads. (The data on the gelled cell is extrapolated from available data on multi-cell batteries.)

KNOWING WHAT YOU'RE BUYING: Every one of these things I've ever seen (both types) has been, wonder of wonders, clearly marked with its maker's name, rated full-charge voltage, and capacity in amp-hours. As for distinguishing between the two types, if it's made by Gates or G.E. and says "sealed lead-acid battery" or "sealed rechargeable battery" on it, it's a fully-sealed unit; otherwise, assume it's vented.

USING WHAT YOU'VE BOUGHT: These batteries, like most lead-acid batteries, have a very low internal impedance and so can deliver lots of current to a load. In fact, they shouldn't be used at all in low-current circuits (their useful life will be reduced). They're equally at home in stand-by (i.e. float-charged) or cyclic (frequent discharge/charge cycles) service. About the only warning as far as discharging is concerned is to guard against accidental shorts, especially with the larger sealed cells; while 100 amps may not melt your screwdriver, it'll certainly heat it enough to cause a nasty burn.

RECHARGING: Every manufacturer has slightly different ideas about how their cells should be recharged; instead of trying to survey them all, I'll give you some guidelines that seem to work

well for all the units I've tested so far. Your charging supply should deliver between 2.4 and 2.5 volts per cell, and when connected to a discharged battery, should deliver no more than about 0.4C/hr (C is the battery's capacity in amp-hours; for a 2.5 AH unit, 0.4C/hr would be 200 ma.). Keep an eye on the charging current; the battery is fully charged when it drops to about 0.01C/hr (or levels off). This will usually take from 12 to 16 hours. The charger should then be disconnected or its output reduced to about 2.35 volts/cell; the battery can be kept float-charged at this lower voltage indefinitely. If your initial charging voltage is only 2.35 volts/cell (as in a standby circuit), expect a 24-hour charging period.

The fully-sealed cells can be fast-charged by using a higher-voltage, constant-current source. The current should be limited to about 1C/hr (e.g. 5 amps for a 5 AH cell). Use as much voltage as it takes to force this much current into the cell. You must monitor the voltage at the cell terminals and stop charging when it climbs above about 2.1 volts. True, the sealed cells are virtually indestructible: I once tried to ruin an "X" cell by running 10 amps into it for 5 hours, and managed to reduce its amp-hour rating by all of 5%. But such treatment is not advisable for cells you plan to use later.

Let me know if you need data sheets for a particular manufacturer; I probably have them.

PROBLEMS: Usually curable. Older gel-cell batteries will sometimes develop a high internal impedance; they appear to take a charge, but their output voltage falls off immediately when they're connected to a load. I have restored several of these by deliberately over-charging them (using about 3 volts/cell for a few hours). Be sure to leave a window open if you try this; you don't want free hydrogen and oxygen gas accumulating in your workroom.

The sealed cells will sometimes develop a very high impedance that makes ordinary charging impossible; a sure cure is to apply about 20 volts (with no current limiting) for an hour or two. In both cases the problem is due to sulphate deposits on the cell's plates; by using excess voltage you cause the deposits to recombine with the electrolyte despite their high resistance. You can't use as high a voltage on gel-cells because you can't get to the single bad cell in the battery; the good cells will overheat and vent off so much electrolyte that they'll be ruined.

PRICES: New Gates "X" and "D" cells go for \$6.32 and \$4.40 apiece, respectively, in single-unit quantities. Poly Paks wants \$14.95 for a set of four "X" cells, which isn't at all bad for forty watt-hours of battery. The Globe Gel-cell battery that Poly Paks is selling is about ten watt-hours for almost the same price. 'Nuff said.

I've seen used and new units of both types at retail surplus places, so check your local techie-junk outlets. The sealed cells are obviously better, but don't snub gel-cells if you can find them at a good price. Happy charging, and may the electromotive force be with you.

	sealed lead-acid	NiCad	vented lead-acid
Fast charging (to 80% capacity)	<1 hour	<1 hour	>7 hours
Float charging	yes	no (memory problem)	yes
Peak power (watts)	100	50	70
Peak W/cu. in.	28	14	13
Peak Watts/lb	250	150	170
Volts/cell	2.0	1.25	2.0
Amp-hrs/cell	2.5	4.0	2.5
Watt-hrs/cell	5.0	5.0	5.0
WH/cu. in.	1.4	1.6	1.9
WH/lb.	12.5	14.8	12.1
Self-discharge (at 20 deg. C)	6%/month	30%/mo.	4-12%/mo.
Use cycles	200-400	500	50-200
Cell reversal	No	Yes	No
"Memory" effect	No	Yes	No

Pseudorandomnesses

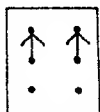
Does anyone know enough about photoetching to write a Pyro article on doing it at home? Without, hopefully, gassing the neighbors or having to buy supplies fifty-five gallons at a time? What metals can be worked this way, what chemicals do you use for each, where can we get them in reasonable quantities, and how do we use them once we've got them?

A local outfit is selling Automatic Electric touch-tone pads from Trimline-style phones for \$1.50 each. I haven't been able to get them to work. Either the ones I bought were bad or I keep guessing wrong on the wires. Does anyone have any hard data on these?

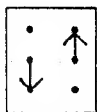
The new Star Trek phaser toys look interesting. They contain an IR LED and sensor unit. Firing produces a pulsed beam of IR and an appropriate sound effect. When one phaser is "hit" by the beam from another, it emits a loud explosion sound and refuses to fire for ten seconds or so. (A near-miss causes the target phaser to produce a sound reminiscent of a bullet ricochet. So much for believability.) I expect hundreds of these obnoxious things to start showing up at cons in the hands of neofens. (If you don't think so, consider the Logan's Runners we've had to put up with for the last 'n' years.) Who will be the first to come up with a circuit that will pulse a large omnidirectional IR source at the appropriate frequency to jam the phasers?

A number of surplus stores on the West coast have been selling some rather unusual switches. These look like standard Alco or C&K DPDT miniature (1/4" mounting hole) center-off toggle switches, but they have an extremely strange switching function:

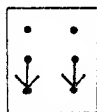
(view from terminal end of switch)



toggle
downward



toggle
centered



toggle
upward

Like I said: Unusual. Useful, but unusual. And very confusing if you were expecting a normal switch. These mutations can be identified by their part number (C&K 7211) and by the legends on the side that identify the toggle positions; where a standard center-off switch will be marked "on-off-on", these are marked "on-on-on".

In Pyro 22 Jeff had a sample of 12-pitch, eight lines/inch type. I think it looks awful. Sorry about that, Jeff. 12 pitch by itself is fine if you have an appropriate typewheel (Prestige Elite looks nice), but let's leave the vertical spacing as-is.

• • •

WHEW!!

Captain Al said it at the end of Pyro 18: You really have to do one of these before you can appreciate how much effort it takes. I want to publicly apologize for the lateness of this issue. I originally told Jeff I'd have the masters in the mail to him around the first week in January. But a funny thing happened around the end of the year: The word processor was suddenly tied up after hours with some new-project proposals, and then I was tied up after hours nursing a brand-new operating system to life...so by the time this lovely machine and I got together again, Pyro 23 was already several weeks late, and there was still much work to do.

Fond memories: Fretting over putting cartoons on the same page with Jeff's beautiful Christmas message; fretting over getting the issue out so late that some of you may well wonder what a Christmas message is doing in it; worrying about the surplus of text and shortage of artwork; losing an hour's worth of editing to a static charge... I'm sure Jeff would never have given us this issue if we'd known it would take this long. For that matter, we probably wouldn't have offered to do it, either.

...And if you believe that, I'll tell another one. Yah, it's been trying, but it's been a lot of fun too. Let us know what you think of our efforts: We'll probably ask to do another issue sometime or other [Oh, NO!!! --Mob], and we could use the feedback.

Keep on technin', and see you at Noreascon.

P.S.--Send all questions, comments, gripes, kudos, and spare change to:

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